(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
4 October 2001 (04.10.2001)

PCT

(10) International Publication Number
WO 01/72160 A1

(51) International Patent Classification[7]: A42B 3/00

(21) International Application Number: PCT/KR00/00287

(22) International Filing Date: 30 March 2000 (30.03.2000)

(25) Filing Language: English

(26) Publication Language: English

(71) Applicant and
(72) Inventor: LEE, Dong, Seon [KR/KR]; 977-40 Mansu-dong, Namdong-gu, Incheon-city 405-240 (KR).

(74) Agent: LEE, Young, Pil; The Cheonghwa Building, 1571-18 Seocho-dong, Seocho-gu, Seoul 137-073 (KR).

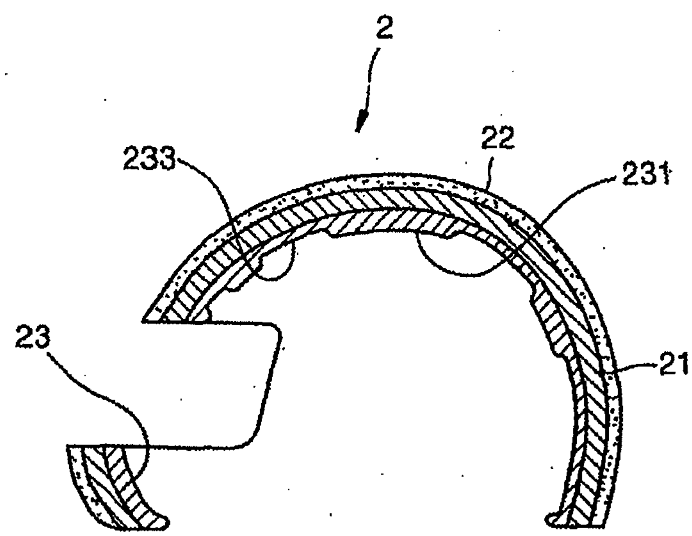
(81) Designated States *(national)*: BR, CA, CN, JP, US.

(84) Designated States *(regional)*: European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

Published:
— *with international search report*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: SAFETY HELMET FORMED OF HYBRID COMPOSITE MATERIAL AND METHOD FOR MANUFACTURING THE SAME



(57) Abstract: A safety helmet including a stack of hybrid composite material formed of a fiber-enforced composite material and a high-elastic fiber-enforced composite material, and a method for manufacturing the safety helmet. The safety helmet is light weight and has enhanced impact resistance. Also, the safety helmet can be easily manufactured at low cost. The improved structure of a cushion pad on the inside of the safety helmet facilitates air circulation within the head-to-pad contact space, so that the safety helmet can be worn for a long time without an unpleasant feeling.

WO 01/72160 A1

SAFETY HELMET FORMED OF HYBRID COMPOSITE MATERIAL AND METHOD FOR MANUFACTURING THE SAME

Technical Field

The present invention relates to a safety helmet formed of a hybrid composite material and a method for manufacturing the same, and more particularly, to a safety helmet including a stack of hybrid composite material formed of a fiber-enforced composite material and a high-elastic fiber-enforced composite material, which is light weight, has superior impact resistance, and can be manufactured with easy at low cost.

Background Art

The shell of known safety helmets in the art is formed by shaping and curing a single thick film, or a stack of thin films as shown in FIG. 1, of a fiber-enforced composite material 11 into a helmet shape. The fiber-enforced composite material 11 refers to a mixture of fibers such as glass fiber, carbon fiber, aramid fiber and spectra fiber, or nonwoven fabric. The large fiber content in the fiber-enforced composite material 11 for the shell of the safety helmet increases the weight of the safety helmet 11. Also, during a subsequent process for providing the smooth surface of the safety helmet 1, the fiber-enforced composite material 11 containing glass fiber is processed, which causes harmful dust. Accordingly, additional equipment for removing such dust is required, and the need for additional equipment increases the manufacturing cost.

As shown in FIG. 2, a cushion pad 13 capable of buffering possible impact from the outside, is lined along the inner surface of the safety helmet 1. The cushion pad 13 is commonly shaped to tightly surround a person's head, so that when a person wears the safety helmet 1 for a long time, there is discomfort due to the unsmooth air circulation therein. Also, the unsmooth air circulation results in much sweat, heat and odor inside the helmet and in the hair of the person wearing the helmet, which is undesirable for the reasons of sanitation. These unpleasant conditions directly or indirectly affects safety.

The manufacture of the conventional safety helmet 1 varies depending on the shape of the safety helmet sought to be produced.

As shown in FIG. 3, for a safety helmet which is larger than a semisphere, a mold 12 having a head-like space therein is utilized. The mold 12 consists of a plurality of mold fragments 121, which are assembled into or separated from the mold 12 to facilitate the shaping of a safety helmet. Initially, the mold fragments 121 are assembled to form the head-like space in the mold 12, and the fiber-enforced composite material 11 is layered on the inner surface of the mold 12 and subjected to a heating process for curing the fiber forced composite material 11, thereby resulting in a completed safety helmet. However, this manufacturing technique makes it difficult to apply effective pressing means capable of pressing the entire surface of the layered fiber-enforced composite material 11 with equal force. Accordingly, a smooth surface, which has a good aesthetic appearance, cannot be provided. As a result, this conventional technique requires subsequent cutting and polishing processes to give such a smooth surface to the safety helmet, thereby lowering the productivity.

As shown in FIG. 4, for a safety helmet which is smaller than a semisphere, a mold 12′ consisting of just two parts, an upper portion 122 and a lower portion 123, is employed. When the upper portion 122 is engaged with the lower portion 123 while the fiber-enforced composite material 11 is laid on the lower portion 123 with the head-like space, the safety helmet is shaped and simultaneously pressed during the curing process. As a result, a safety helmet with a more smooth surface than a safety helmet formed by the method described with reference to FIG. 3, can be obtained. However, the use of a mold 12′ such as that shown in FIG. 4 does not allow various shapes depending on the need.

Disclosure of the Invention

To solve the above problems, it is an objective of the present invention to provide a safety helmet formed of a hybrid composite material, which is light weight and has superior impact resistance, and can be manufactured with

easy and at low cost.

It is another objective of the present invention is to provide a safety helmet formed of the hybrid composite material, adopting a cushion pad which allows for a smooth air circulation within the inner space of the safety helmet, thereby providing a pleasant feeling even for a long time wearing, without heavy feelings.

It is a third objective of the present invention is to provide a method for manufacturing the safety helmet formed of a hybrid composite material, which has a light weight and superior impact resistance, and can be manufactured with easy and at low cost.

An aspect of the present invention is achieved by a safety helmet including a stack of hybrid composite material formed of a fiber-enforced composite material and a high-elastic fiber-enforced composite material.

Another aspect of the present invention is achieved by a method for manufacturing a safety helmet, comprising: molding a liner in a head-like shape with a thermosetting resin; forming a stack of hybrid composite material on the liner with a fiber-enforced composite material and a high-elastic fiber-enforced composite material; and placing the liner with the stack of hybrid composite material in a mold assembled from a plurality of mold fragments, and applying pressure to the liner with a metal pad in a high-temperature chamber, to harden the hybrid composite material.

<u>Brief Description of the Drawings</u>

FIG. 1 is a sectional view showing an example of a conventional safety helmet formed of a fiber-enforced composite material;

FIG. 2 is a side sectional view of the safety helmet of FIG. 1, illustrating a cushion pad attached to the inside of the safety helmet;

FIG. 3 is a sectional view illustrating the manufacture of a safety helmet which is larger than a semisphere;

FIG. 4 is a sectional view illustrating the manufacture of a safety helmet which is smaller than a semisphere;

FIG. 5 is a sectional view illustrating an embodiment of a safety helmet

formed of a hybrid composite material according to the present invention;

FIGS. 6 and 7 are side and front sectional views of the safety helmet formed of a hybrid composite material in FIG. 5, respectively, illustrating the attachment of a cushion pad to the inner surface thereof;

FIG. 8 is a bottom view of the safety helmet adopting the cushion pad shown in FIGS. 6 and 7;

FIG. 9 is a sectional view illustrating a method for manufacturing a safety helmet with a hybrid composite material according to the present invention; and

FIGS. 10 through 14 show the results of impact tests on the safety helmet samples manufactured in Examples 1 through 4 and Comparative Example.

Best mode for carrying out the Invention

With reference to FIG. 5, a safety helmet 2 formed of a hybrid composite material according to the present invention includes a liner 21, which is molded to have a head-like shape with a thermoplastic resin, and a stack of hybrid composite material 22 which forms the outer shell of the safety helmet 2, wherein the stack of hybrid composite material 22 includes a layer of fiber-enforced composite material 221 and a layer of high-elastic fiber-enforced composite material 222 which are alternately stacked.

The thermoplastic resin may be any commercially available resin such as polyethylene, polystyrene, polybutyleneterephtalate, polyvinylchloride (PVC), polymethylmethacrylate (PMMA), ABS resin (an acrylonitrile-butadiene-styrene copolymer), polypropylene, nylon, polyethyleneterephtalate and polycarbonate. Preferably, resins having superior adhesive properties to a thermosetting resin for the hybrid composite material 22, and superior impact resistance and molding properties are selected for the liner 21. The liner 21, which is molded into a head-like shape with the thermoplastic resin, forms the frame of the safety helmet 2.

The hybrid composite material 22 refers to the stack of the fiber-enforced composite material 221, which is common in the art, and the high-

elastic fiber-enforced composite material 222. The term "composite" material refers to a mixture of different materials, which gives enhanced performance or novel physical properties which are not exhibited in the materials, separately.

In the present invention, the hybrid composite material 22 collectively refers to the fiber-enforced composite material 221 and the high-elastic fiber-enforced composite material 222, wherein the fiber-enforced composite material 222 is obtained by mixing glass fiber, carbon fiber, aramid fiber, spectra fiber or mixtures thereof in the form of short or long fibers, fabrics or nonwoven fabrics with a thermosetting resin, and the high-elastic fiber-enforced composite material 222 is obtained by mixing an elastic fiber with good elasticity, for example, polyurethane fibers, nylon fibers, polyethylene terephtalate fibers or mixtures thereof in the form of short or long fibers, fabrics or nonwoven fabrics with a thermosetting resin.

In particular, the safety helmet according to the present invention is improved in impact resistance and keeps its shape better while its weight is sharply reduced. In the hybrid composite material 22 used to form the safety helmet according to the present invention, the fiber-enforced composite material 221 acts as an impact resistive material while the high-elastic fiber-enforced composite material 222 contributes to fixing the fiber-enforced composite material 221 by the elastic strength thereof and enhancing tensile resistance.

FIGS. 6 through 8 are side and front sectional views, and a bottom view of the safety helmet of FIG. 5 according to the present invention, respectively, illustrating the attachment of a cushion pad to the inner surface of the safety helmet.

Referring to FIGS. 6 and 7, a cushion pad 23 attached to the inner side of the liner 21 of the safety helmet 2 has a plurality of head-receiving portions 231, which are projections contacting parts of the head, and grooves 233 between adjacent head-receiving portions 231, which are recessed relative to the head-receiving portions 231.

The cushion pad 23 is formed of an elastic member capable of

absorbing external impact, such as Styrofoam which has been used in the art. The head-receiving portions 231 and the grooves 233 of the cushion pad 23 are arranged in a checkered pattern on the inner side of the liner 21, as shown in FIG. 8. The hatched portions in FIG. 8 indicate the head-receiving portions 231.

When the safety helmet 2 formed of the hybrid composite material according to the present invention is worn, the plurality of head-receiving portions 231 contact the head while the grooves 233 are spaced apart the head.

A method for manufacturing the safety helmet 2 with the hybrid composite material 22 according to the present invention now will be described.

Initially, the head-shaped liner 21 is molded using a thermoplastic resin. The fiber-enforced composite material 221 and the high-elastic fiber-enforced composite material 222 are stacked on the liner 21 to form a stack of the hybrid composite material 22. Preferably, at least two or more stacks of the hybrid composite material 22 are formed on the liner 21. Then, as shown in FIG. 9, the liner 21 with the stack of the hybrid composite material 22 is placed in a mold 12, which can be separated into a plurality of mold fragments 121, and pressed with a metal pad 31 in contact with the liner 21 and then left in a high-temperature chamber to be set.

The step of molding the head-like shaped liner 21 may be regarded as a preliminary molding performed prior to the molding of the hybrid composite material 22 within the liner 21. In the preliminary molding step, the contour of the safety helmet 2 according to the present invention is set by forming the liner 21 in a head-like shape with a thermoplastic resin which is an easy-to-handle-material in molding.

In the step of stacking the fiber-enforced composite material 221 and the high-elastic fiber-enforced composite material 222 on the liner 21, two or more stacks of the hybrid composite material 22 are layered in sequence. The resin consisting of each composite material for the hybrid composite material 22 may be a thermosetting resin such as unsaturated polyester, epoxy resin

or phenol resin. The use of the thermosetting resin can prevent deformation of the safety helmet 2 due to exposure to heat and improve impact resistance.

The feature of the present invention is the application of the hybrid composite material 22 to the safety helmet 2, which should be light and requires impact resistance. In particularly, two or more layers of the hybrid composite material 22 are deposited in manufacturing the safety helmet 2.

The fiber-enforced composite material 221, which is a mixture of enforcing fiber and a thermosetting resin, and the high-elastic fiber-enforced composite material 222, which is a mixture of a high-elastic fiber thin film and a thermosetting resin, may be stacked to one another to form the hybrid composite material 22 and then attached to the liner 21 of the safety helmet 2. Alternatively, the fiber-enforced composite material 221 and the high-elastic fiber-enforced composite material 222 may be directly deposited in sequence on the liner 21.

In another case, a thermosetting resin for the fiber-enforced composite material 221 may be initially deposited on the liner 21, and a glass fiber in the form of fabric or nonwoven fabric, containing a thermosetting resin or its prepolymer, may be deposited thereon. Next, a high-elastic fiber in the form of fabric or nonwoven fabric, containing a thermosetting resin or its prepolymer, may be deposited thereon, resulting in the hybrid composite material 22. It is appreciated that the hybrid composite material 22 may be sequentially deposited by those skilled in the art.

Next, in the hardening step, the thermosetting resin of the stacked hybrid composite material 22 is cured, thereby resulting in the rigid safety helmet 2 that barely deforms due to heat. The hardening step involves the steps of placing the liner 21 on which the hybrid composite material 22 has been deposited, on the mold 12 that can be separated into the plurality of mold fragments 121, bringing a metal pad 31 to contact the hybrid composite material 22 on the liner 21 and applying a pressure thereto; and leaving the resultant structure in a high-temperature chamber. The metal pad 31 may not contact the entire surface of the liner 21. Preferably, the metal pad 31 has a folding or flexible structure, which allows it to enter into or be taken out of the

mold 12.

Since the safety helmet 2 is set by heat and pressure as mentioned in the above method, a smooth contoured surface, in addition to strong impact resistance can be given to the light safety helmet 2. Thus, a separate postprocessing, for example, a polishing process, is not required. In addition, although an additional polishing process is carried out to maximize the commercial value of the product, there is no concern about generation of dust that is harmful to the human body since the outermost surface of the safety helmet 2 is formed of a high-elastic fiber-enforced composite material. Also, the productivity of the safety helmet 2 increases.

In the safety helmet 2 formed of the hybrid composite material 22 according to the present invention, the cushion pad 23 is attached on the inner side of the safety helmet 2 to have the head-receiving portions 231 that directly contact the head, and the grooves 233 being recessed between head-receiving portions 231. The grooves 233 allow air circulation within the safety helmet 2 when the safety helmet 2 is in use, which provides comfort to the wearer without generation of heat and sweat. Thus, the hair condition of the wearer can be maintained even after a long time with the safety helmet 2 according to the present invention.

The present invention will be described in greater detail by means of the following examples. The following examples are for illustrative purposes and not intended to limit the scope of the invention.

Example 1

A liner 21 having a thickness of 2 mm was formed in a head-like shape with polyethyleneterephtalate. A fiber-enforced composite material 221 formed of a glass fiber fabric incorporated in a unsaturated polyester resin, and a high-elastic fiber-enforced composite material 222 formed of a mixed fabric of polyurethane fiber and nylon incorporated in a unsaturated polyester resin, were deposited in sequence thereon, forming a single layer of hybrid composite material 22, and then subjected to heat and pressure for setting, resulting in a safety helmet having a thickness of 3.6 mm. Then, the safety

helmet was weighted and subjected to impact absorption tests, such as maximum load and total impact energy. The results are shown in Table 1 and FIG. 10. For the impact absorption test, an impact tester (Model. ITR-2000), made by Radmana Co. (Australia), was used and the impact was applied to the sample with a 0.5-MPa nitrogen gas.

Example 2

The process of Example 1 was followed, except that a liner 21 having a thickness of 1 mm was used and the hybrid composite material 22 was deposited to be three layers, resulting in a safety helmet having a thickness of 3.6 mm. The same performance test was carried out under the same conditions. The results are shown in Table 1 and FIG. 11.

Example 3

The process of Example 2 was followed, except that the thickness of individual layers of the hybrid composite material 22 was increased, resulting in a safety helmet having a thickness of 4.3 mm. The same performance test was carried out under the same conditions. The results are shown in Table 1 and FIG. 12.

Example 4

The process of Example 3 was followed, except that the thickness of a glass fiber fabric of the fiber-enforced composite material 221 was increased, resulting in a safety helmet having a thickness of 5.7 mm. The same performance test was carried out under the same conditions. The results are shown in Table 1 and FIG. 13.

Comparative Example

A safety helmet was manufactured by a conventional method using only the fiber-enforced composite material including a glass fiber incorporating a unsaturated polyester resin. The same performance test was carried out under the same conditions. The results are shown in Table 1 and FIG. 14.

Table 1

Example No.	Structure	Thickness (mm)	Impact Test				
			Maximum load (N)	Total impact energy (J)	First-half impact energy (J)	Second-half impact energy (J)	Deformation (mm)
Example 1	2 mm liner plus a 2-layered stack	3.6	3,264	34.84	11.94	22.90	15.49
Example 2	1 mm liner plus a 3-layered stack	3.6	3,952	32.64	13.17	19.47	14.80
Example 3	1 mm liner plus a 3-layered stack	4.3	4,706	32.73	21.19	11.54	14.94
Example 4	1 mm liner plus a 3-layered stack	5.7	5,484	51.09	22.11	29.98	18.07
Comparative Example	Conventional safety helmet	5.2	5,292	30.97	10.40	20.57	12.16

Table 1 shows that the total impact energy was higher for Examples 1 through 4 than for Comparative Example. Also, the average of the safety helmets of Examples 1 through 4 was decreased by about 40% on the average with an equal or slightly higher thickness, with respect to the safety helmet of Comparative Example, which has a weight of about 1,200 grams.

In particular, the safety helmet of Example 2, which shows a superior impact resistance with the smallest thickness, is regarded as a substitute for the conventional safety helmet. Also, the safety helmet of Example 3, which shows the highest first-half impact energy, can be used for special purpose, for example, as a safety helmet that requires a high resistance to sudden impact.

In addition, the total impact resistance for Example 4 is increased by about 65% with respect to the Comparative Example, and thus the safety

helmet of Example 4 can be used when safety is at upmost importance.

In the safety helmet and the method for manufacturing the same according to the present invention, the weight of the safety helmet can be reduced with a strong impact resistance. Also, the layered structure of the safety helmet can be varied for special purposes, for example, in order to enforce the resistance to sudden impact, or to further improve safety. In addition, the safety helmet according to the present invention can be worn for a long time without an unpleasant feeling.

Industrial Applicability

The safety helmet formed of a hybrid composite material and the method for manufacturing the same according to the present invention can be used for the purpose of improving safety, for example, for riding a motor cycling, race car driving and the like.

What is claimed is:

1. A safety helmet including a stack of hybrid composite material formed of a fiber-enforced composite material and a high-elastic fiber-enforced composite material.

2. The safety helmet of claim 1, wherein the fiber-enforced composite material is obtained by mixing glass fiber, carbon fiber, aramid fiber, spectra fiber or mixtures thereof in the form of short fiber, long fiber, fabric or nonwoven fabric with a thermosetting resin, and the high-elastic fiber-enforced composite material is obtained by mixing polyurethane fiber, nylon fiber, polyethylene terephtalate fiber or mixtures thereof, which is a high elastic fiber, in the form of short fiber, long fiber, fabric or nonwoven fabric with a thermosetting resin.

3. The safety helmet of claim 1, wherein the stack of hybrid composite material is deposited on the outer surface of a liner, and an elastic cushion pad is attached on the inner surface of the liner, the cushion pad having a plurality of head-receiving portions, which contact the head, and grooves recessed between adjacent head-receiving portions.

4. A method for manufacturing a safety helmet, comprising:

molding a liner in a head-like shape with a thermosetting resin;

forming a stack of hybrid composite material on the liner with a fiber-enforced composite material and a high-elastic fiber-enforced composite material; and

placing the liner with the stack of hybrid composite material in a mold assembled from a plurality of mold fragments, and applying pressure to the liner with a metal pad in a high-temperature chamber, to harden the hybrid composite material.

5. The method of claim 4, wherein in forming a stack of hybrid composite material, at least two or more stacks of hybrid composite material

are formed.

6. The method of claim 4, wherein the fiber-enforced composite material is obtained by mixing glass fiber, carbon fiber, aramid fiber, spectra fiber or mixtures thereof in the form of short fiber, long fiber, fabric or nonwoven fabric with a thermosetting resin, and the high-elastic fiber-enforced composite material is obtained by mixing polyurethane fiber, nylon fiber, polyethylene terephtalate fiber or mixtures thereof, which is a high elastic fiber, in the form of short fiber, long fiber, fabric or nonwoven fabric with a thermosetting resin.

FIG.1

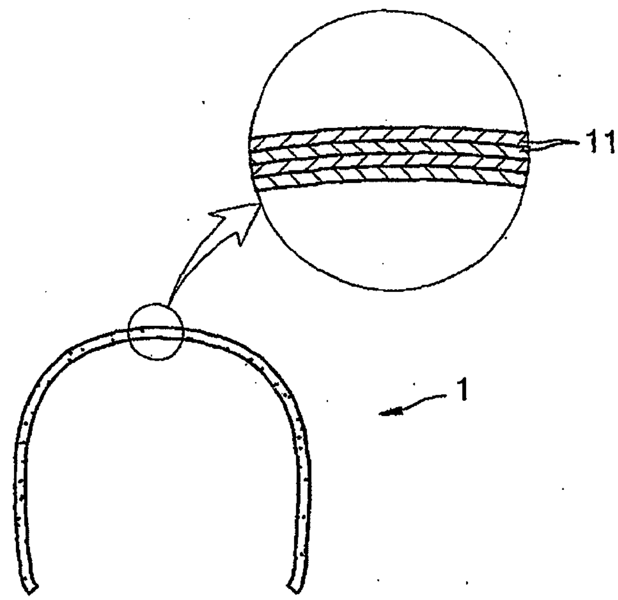


FIG.2

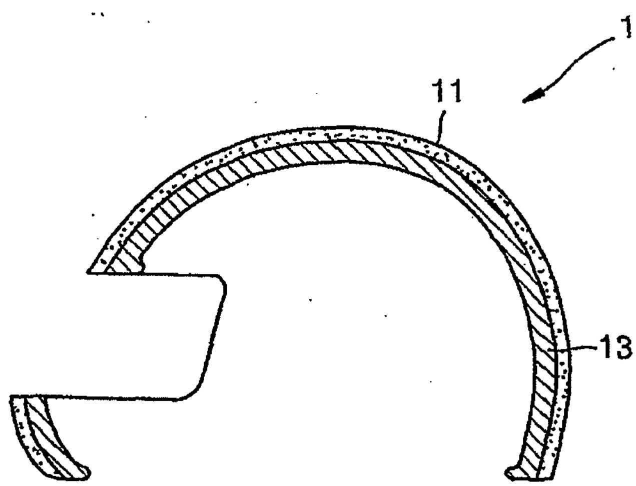


FIG.3

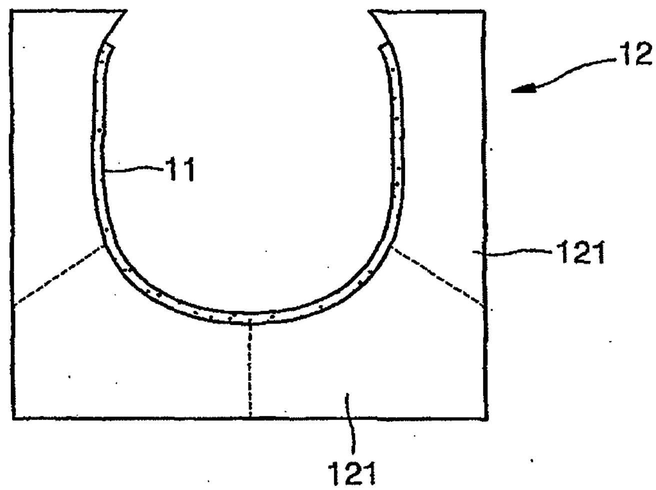


FIG.4

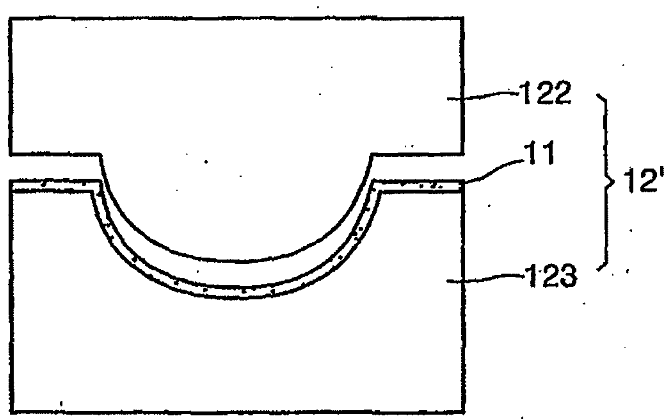


FIG.5

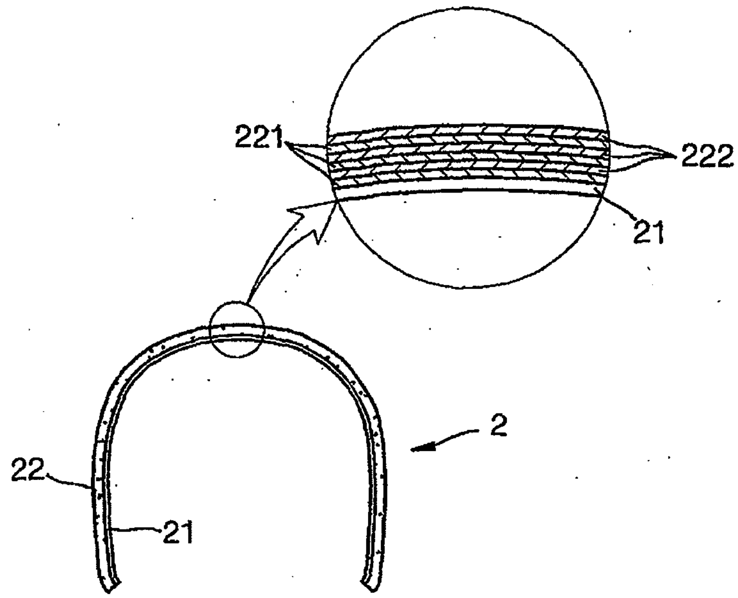


FIG.6

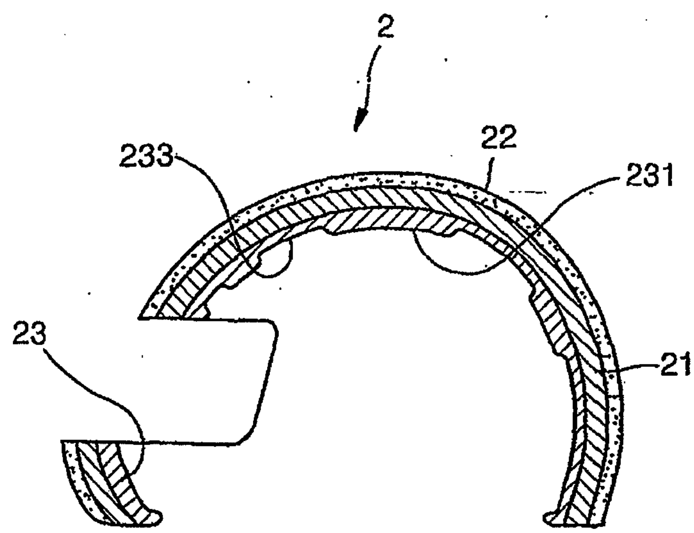


FIG.7

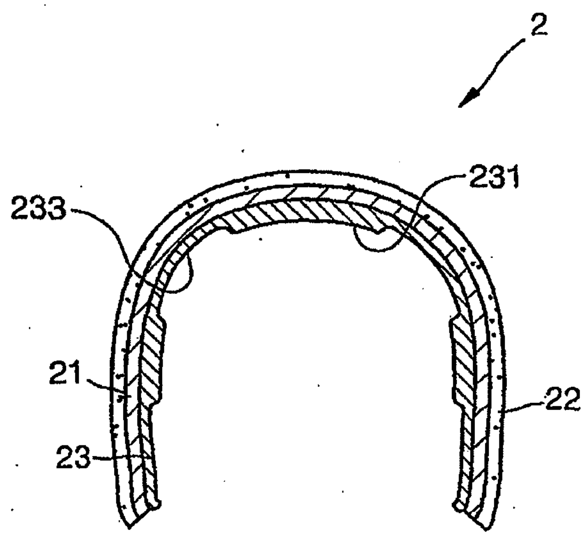


FIG.8

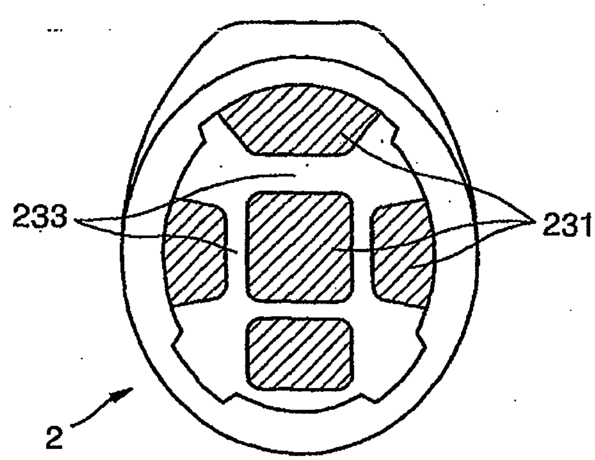


FIG.9

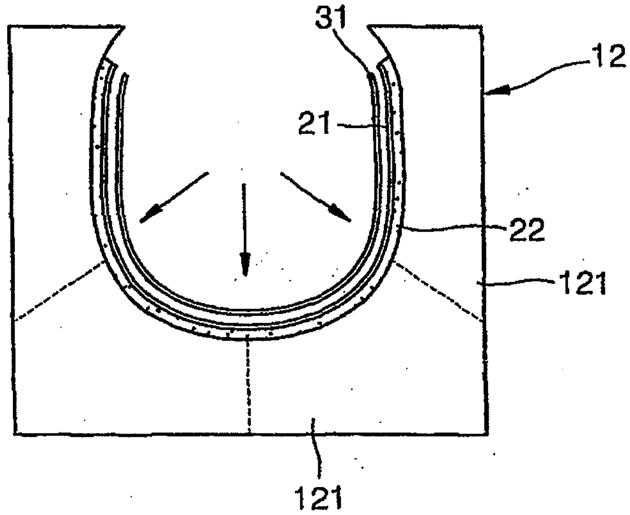

31
12
21
22
121
121

FIG.10

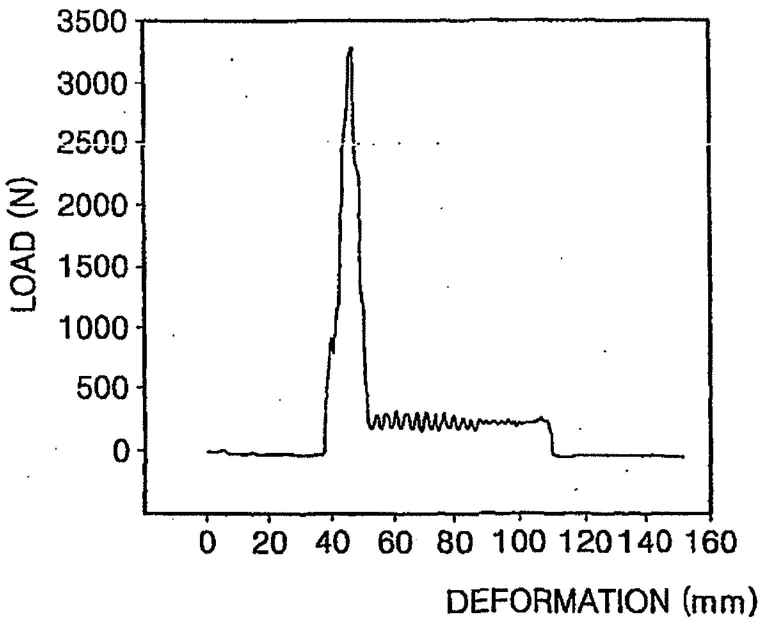

3500
3000
2500
2000
1500
1000
500
0
LOAD (N)
0 20 40 60 80 100 120 140 160
DEFORMATION (mm)

FIG.11

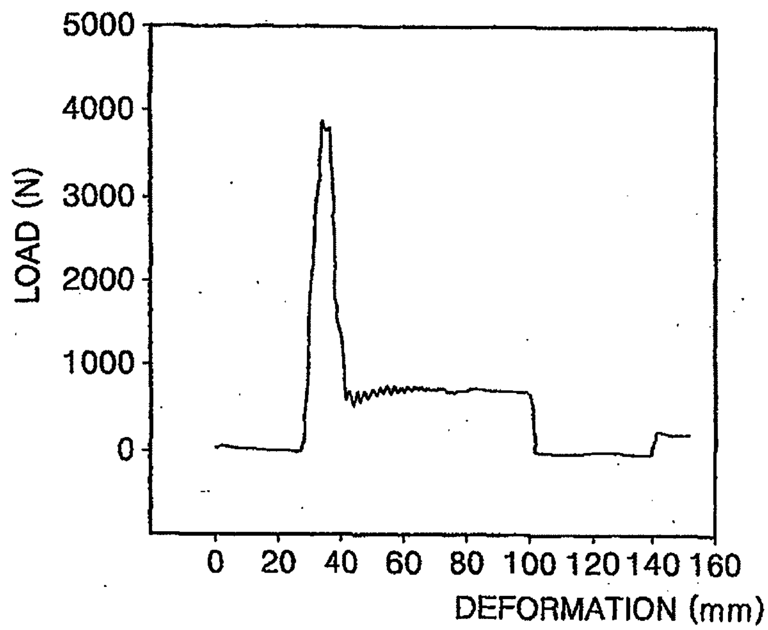

5000
4000
3000
2000
1000
0
LOAD (N)
0 20 40 60 80 100 120 140 160
DEFORMATION (mm)

FIG.12

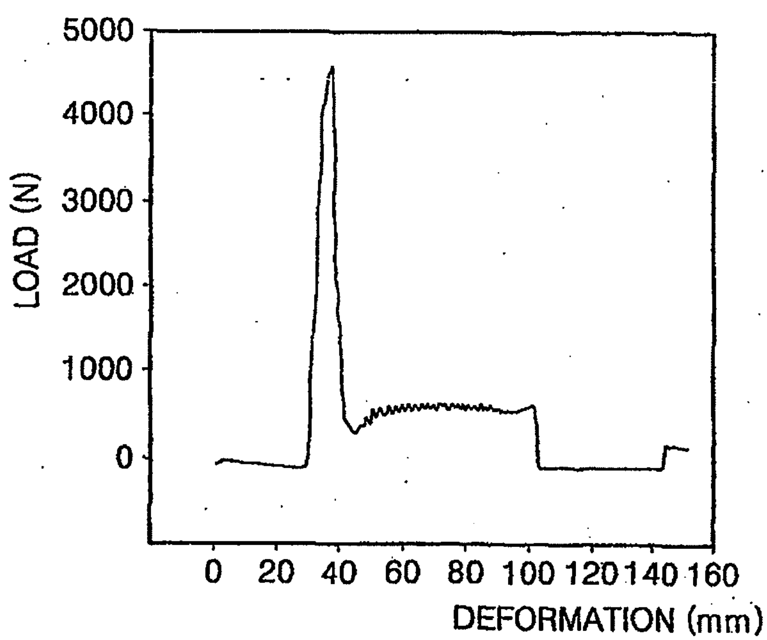

5000
4000
3000
2000
1000
0
LOAD (N)
0 20 40 60 80 100 120 140 160
DEFORMATION (mm)

FIG.13

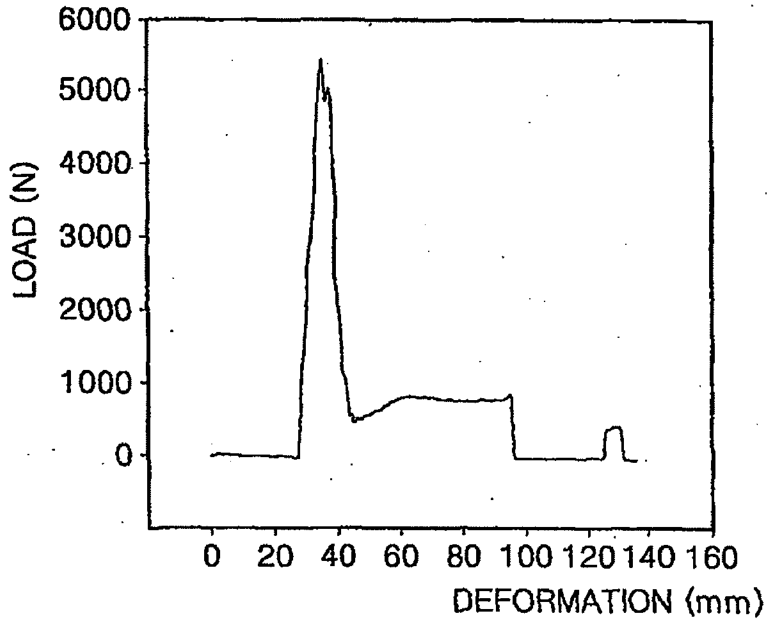
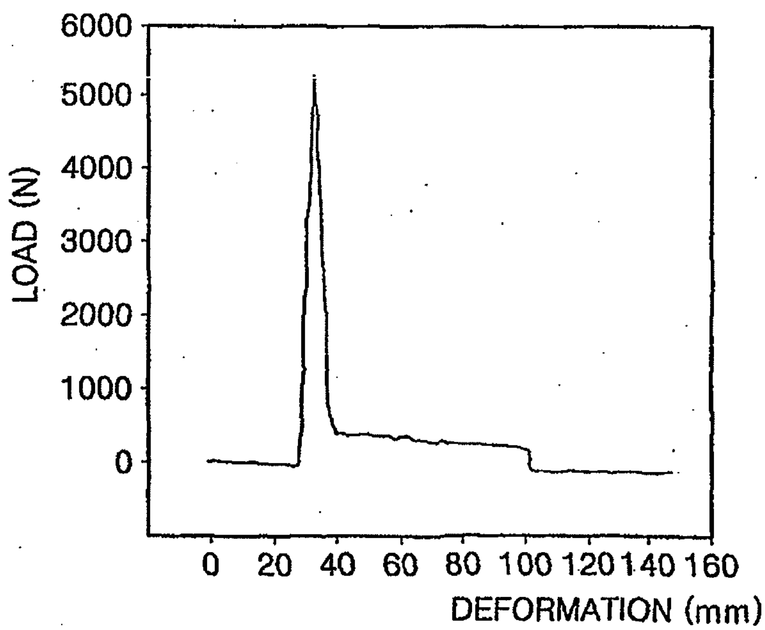

6000
5000
4000
3000
2000
1000
0
LOAD (N)
0 20 40 60 80 100 120 140 160
DEFORMATION (mm)

FIG.14


6000
5000
4000
3000
2000
1000
0
LOAD (N)
0 20 40 60 80 100 120 140 160
DEFORMATION (mm)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR00/00287

A. CLASSIFICATION OF SUBJECT MATTER

IPC7 A42B 3/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimun documentation searched (classification system followed by classification symbols)
IPC7 A42B

Documentation searched other than minimun documentation to the extent that such documents are included in the fileds searched
JP:IPC AS ABOVE

Electronic data base consulted during the intertnational search (name of data base and, where practicable, search trerms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4466138 A(GESSALIN JEAN) AUG. 21, 1984(FAMILY)	1-3
Y	JP 11-36130 A(OKUSIZMI) FEB. 09, 1999(FAMILY NONE)	1-2
Y	JP 9-78331 A(SEIMURA) MAR. 25, 1997(FAMILY NONE)	1-2

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevence
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevence; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevence; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents,such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
22 DECEMBER 2000 (22.12.2000)	26 DECEMBER 2000 (26.12.2000)

Name and mailing address of the ISA/KR	Authorized officer
Korean Industrial Property Office Government Complex-Taejon, Dunsan-dong, So-ku, Taejon Metropolitan City 302-701, Republic of Korea	LEE, Min Hyung
Facsimile No. 82-42-472-7140	Telephone No. 82-42-481-5614

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/KR00/00287

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A-4466138	21-08-1984	FR-A-8014041	24-06-80
		AT-A-9540	15-10-84
		CA-A-1160414	17-01-84
		EP-A-42782	30-12-81
		JP-A-57025404	10-02-82